REMARKS

Attached hereto is a Petition and Fee for Extension of Time under 37 CFR 1.136(a) for a three-month time extension.

Claims 1-12 are all of the claims pending in the present Application. Claim 1 is amended. New claims 7-12 have been added.

It is noted that the claim amendment herein is intended solely to more particularly point out the present invention for the Examiner, and not for distinguishing over the prior art or the statutory requirements directed to patentability.

It is further noted that, notwithstanding any claim amendments made herein, Applicant's intent is to encompass equivalents of all claim elements, even if amended herein or later during prosecution.

Claims 1 and 3-6 stand rejected under 35 USC §103(a) as unpatentable over US Patent 5,541,753 to Raynes et al. Claim 2 stands rejected under 35 USC §103(a) as unpatentable over Raynes, further in view of Applicant's Admitted Prior Art.

These rejections are respectfully traversed in view of the following discussion.

I. THE CLAIMED INVENTION

As described and claimed, for example by claim 1, the present invention is directed to a liquid-crystal display (LCD) including a liquid-crystal layer provided between a pair of substrates so as to be oriented to bend alignment. A phase compensation plate is provided outside each of the substrates. The retardation of a light passing through the liquid-crystal layer and the phase compensation plates is limited to a value ½ or less of a minimum wavelength of the light relating to display.

The present invention addresses the problem demonstrated in Figure 10 in which the electrooptical characteristic of the LCD exhibits a transmittance curve of a shortest wavelength color as differing from other colors (e.g., the other two primary colors), thereby causing the need for different applied-voltage settings.

In contrast, the present invention teaches the selection of a single applied-voltage setting based on the retardation of the shortest wavelength color filter.

II. THE PRIOR ART REJECTION

The Examiner alleges that Raynes essentially teaches the invention defined by claims 1 and 3-6 but concedes that Raynes does "... not explicitly disclose a retardation value of a minimum wavelength of the light relating to display (i.e., blue color range of 388nm to 488 nm)." Nevertheless, the Examiner considers that the discussion in Raynes of visible light "... makes possible the claimed range of 380 nm to 488 nm, and such overlapping ranges are at least obvious."

However, a key feature of the present invention is that it addresses the problem of the electrooptical characteristic of the LCD shown in Figure 10 in which the blue transmttance curve first increases and then monotonically decreases. The red and green transmittance curves monotonically decrease. Therefore, different circuits are necessary to provide voltages that compensate for this difference in these curves.

To address this problem and allow a common applied-voltage circuit for all three colors, the present invention teaches that the applied voltage is selected based on the color having the shortest wavelength (e.g., the color blue). By correlating drive voltage with retardation of light of the shortest wavelength, the present invention eliminates the first section of the blue color curve in which transmittance increases.

In contrast, Raynes does not even recognize this problem. Indeed, the only mention of color filters in Raynes is the fleeting mention of color filters at lines 17 and 18 of column 1. There is no discussion or suggestion in Raynes of making any selection based on a specific color, let alone the color having the shortest wavelength.

The problem addressed in Raynes is quite different from that of the present invention. In Raynes, the problem is to provide an LCD having drive voltages less than 5 volts while providing a wide viewing angle. As described at lines 4-5 of column 4, the liquid crystal material is selected to be E7, having a refractive index anisotropy $\Delta n = 0.22$, which is

considerably higher than that used in the present invention (e.g., see Figure 3 of the present application).

In an alternate embodiment shown in Figure 6, Raynes includes phase retardation plates 30,31 to reduce the thickness of the liquid crystal layer. In a third embodiment shown in Figure 7, Raynes includes a mirror 40 to provide a reflective LCD rather than the transmissive LCDs shown in Figures 1 and 6. The reflective LCD of Figure 7 eliminates one of the phase retarders 31 shown in Figure 6.

The Examiner asserts that Raynes teaches: "... a retardation of a light passing through the liquid crystal layer and all phase compensation plates being set to a value $\lambda/2$ or $\lambda/4$ (when M=1) and λ is a wavelength of visible light (claim 10)."

Applicants submit that the rejection of record reflects that the Examiner is a bit confused as to the significance of the device in Raynes.

First, it is noted that claim 10 defines the reflective LCD configuration shown in Figure 7. Thus, it does not have the second phase retarder 31 shown in the transmissive LCD of Figure 6. Accordingly, the claim 10 (e.g., the $\lambda/4$) embodiment does not have <u>two</u> phase compensation plates.

Hence, turning to the clear language of the claims, there is no teaching or suggestion of " ...a phase compensation plate provided for the outside <u>of each of the substrate</u>" for the $\lambda/4$ embodiment shown in Figure 7 of Raynes.

Second, relative to the $\lambda/2$ embodiment shown in Figures 1 and 6 of Raynes, the claim terminology used therein, for example in claim 1:

"... wherein the liquid crystal layer has a retardance substantially equal to (M+1)$\lambda/2$ at a first operating voltage of the display and substantially equal to M $\lambda/2$ at a second operating voltage of the display, where M is an integer greater than zero or less than minus one and λ is a wavelength of visible light"

does not describe a condition in which "... retardation of light ... <u>being set to a value</u> ½ or less of a <u>minimum wavelength</u>". That is, the above-quoted claim language is merely describing that the "on" condition occurs at one voltage and the "off" condition occurs at a second voltage (e.g., see lines 20-23 of column 4).

Nor does this simple statement of "on" and "off" imply any dependence on "... a <u>minimum wavelength</u> of said light relating to display." The Examiner's comment concerning

"overlapping ranges" seems to suggest that the Examiner overlooks the clear wording in claim 1 that requires a dependency between "set to a value" and "minimum wavelength".

In contrast to Raynes, in the present invention, the retardation is defined in terms of the wavelength of the shortest-wavelength color. That is, as explained at lines 15-25 of page 16 of the present application, in the present invention, the retardation exemplarily changes in a range between 0 nm and 142 nm for sample S1 and between 0 nm and 192 nm for sample S2. For sample S3, the range is between 0 nm and 262 nm.

The present inventors have realized that this range in retardation is significant in terms of the wavelength of the shortest-wavelength color (e.g., blue). That is, the retardation ranges for samples S1 and S2 are less than ½ the wavelength of blue light, whereas the retardation range for sample S3 is greater.

The benefit of limiting the retardation in terms of the color filter having the shortest wavelength is that there is no need to have multiple voltages for the driving voltage for each color, thereby reducing cost and weight of the electronics of the LCD.

Hence, turning to the clear language of the claims, there is no teaching or suggestion of " ... a retardation of a light passing through said liquid-crystal layer and said phase compensation plates being limited to a value ½ or less of a minimum wavelength of said light relating to display", as required by claim 1.

For the reasons stated above, the claimed invention is fully patentable over the cited references.

Moreover, relative to the rejection for claim 2, Raynes clearly defines limits on the range of d x Δn at lines 43-46 of column 4. The Examiner cannot simply ignore this explicit teaching in the primary reference.

Further, the other prior art of record has been reviewed, but it too, even in combination with Raynes, fails to teach or suggest the claimed invention.

III. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicant submits that claims 1-12, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in

condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

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